Main Injector Lattice Measurement at 120 GeV

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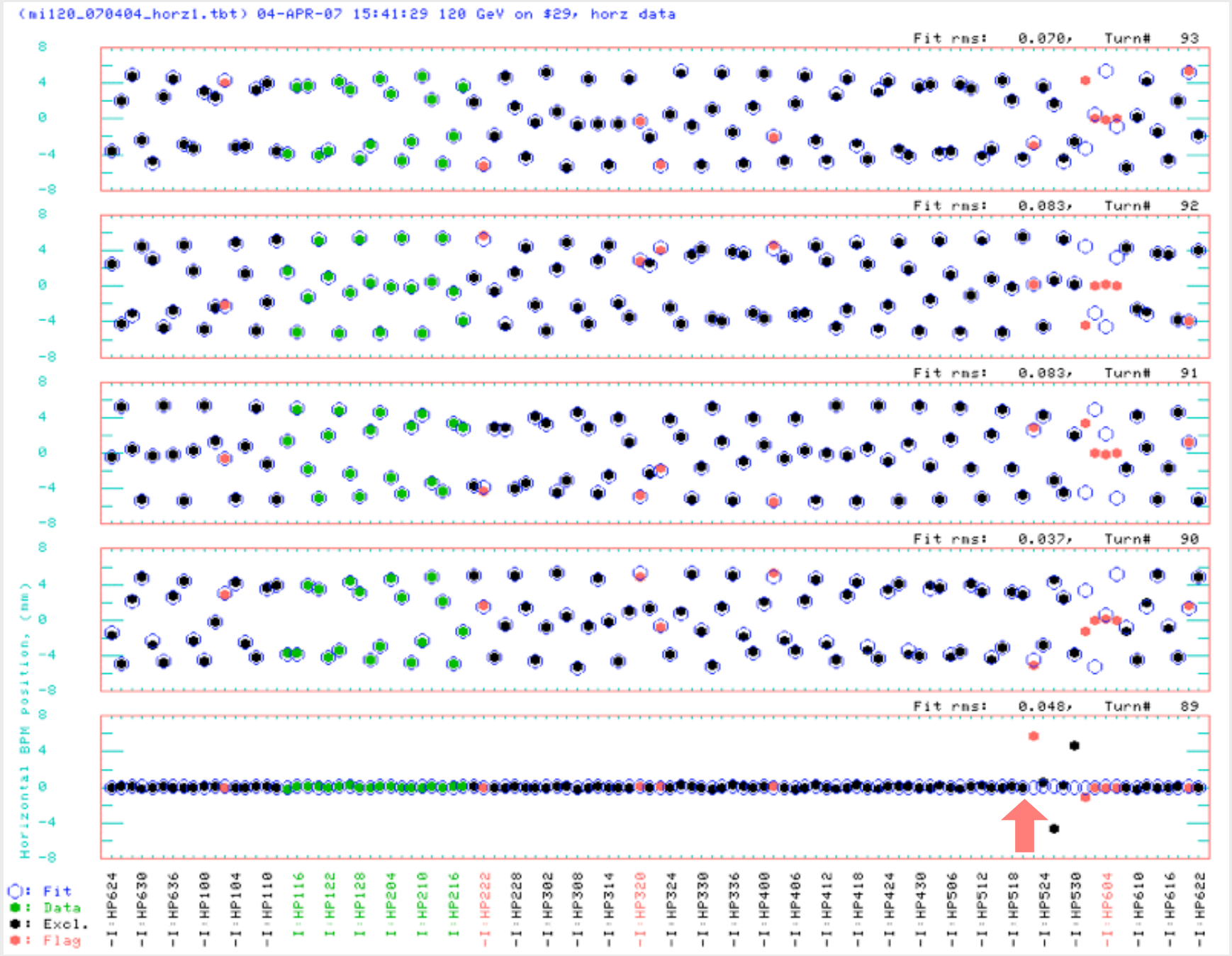
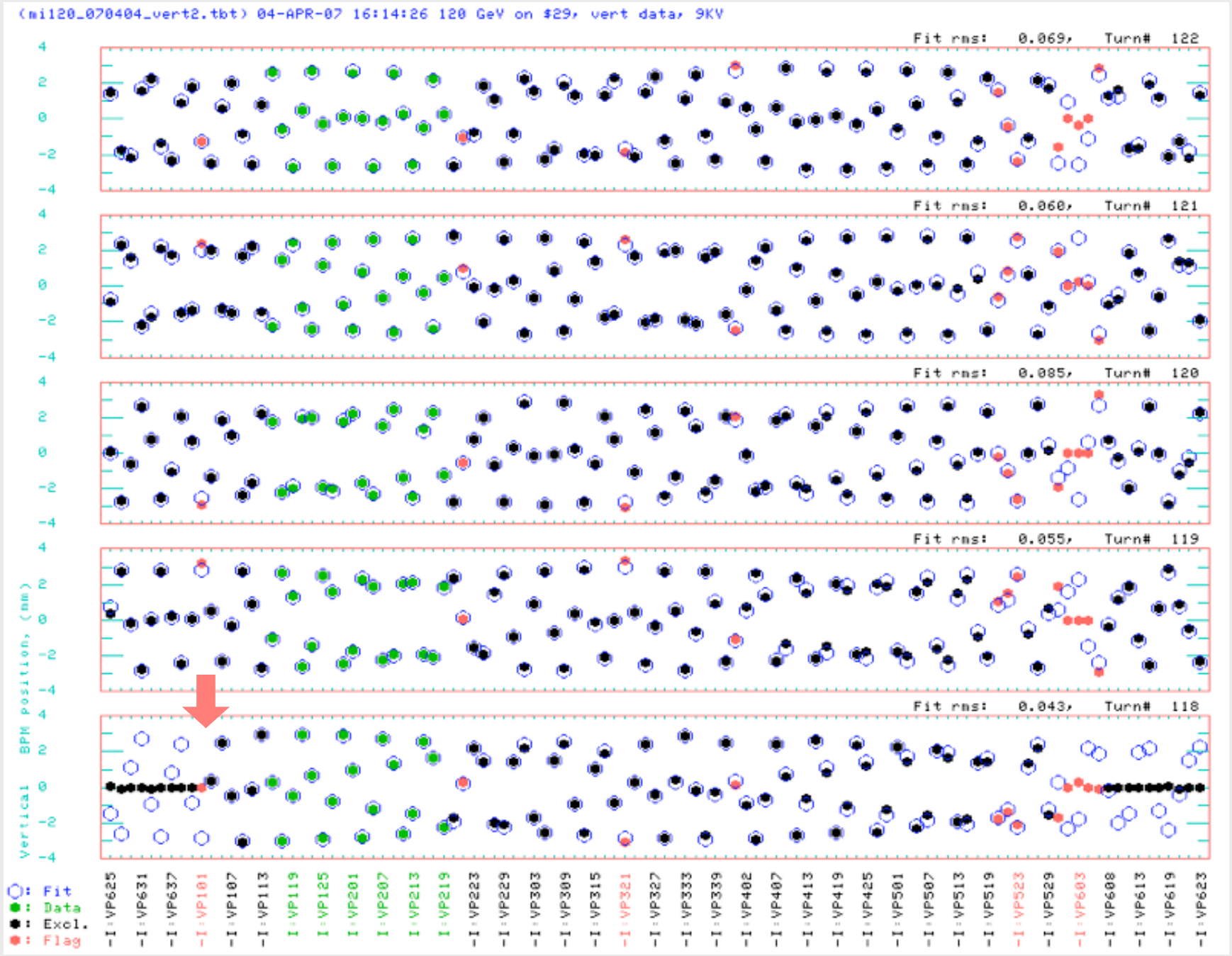
Study

- Take data on $29
  - TLG module #37.
  - Beam to MI dump.
- Horizontal plane
  - Use MI52 kicker
  - Pinged beam at flat-top, 10 KV.
    - ~6 mm oscillation.
- Vertical plane
  - Use all 3 MI10 kickers.
  - Total kick of 9KV, i.e 3KV for each kicker.
    - ~3 mm oscillation.

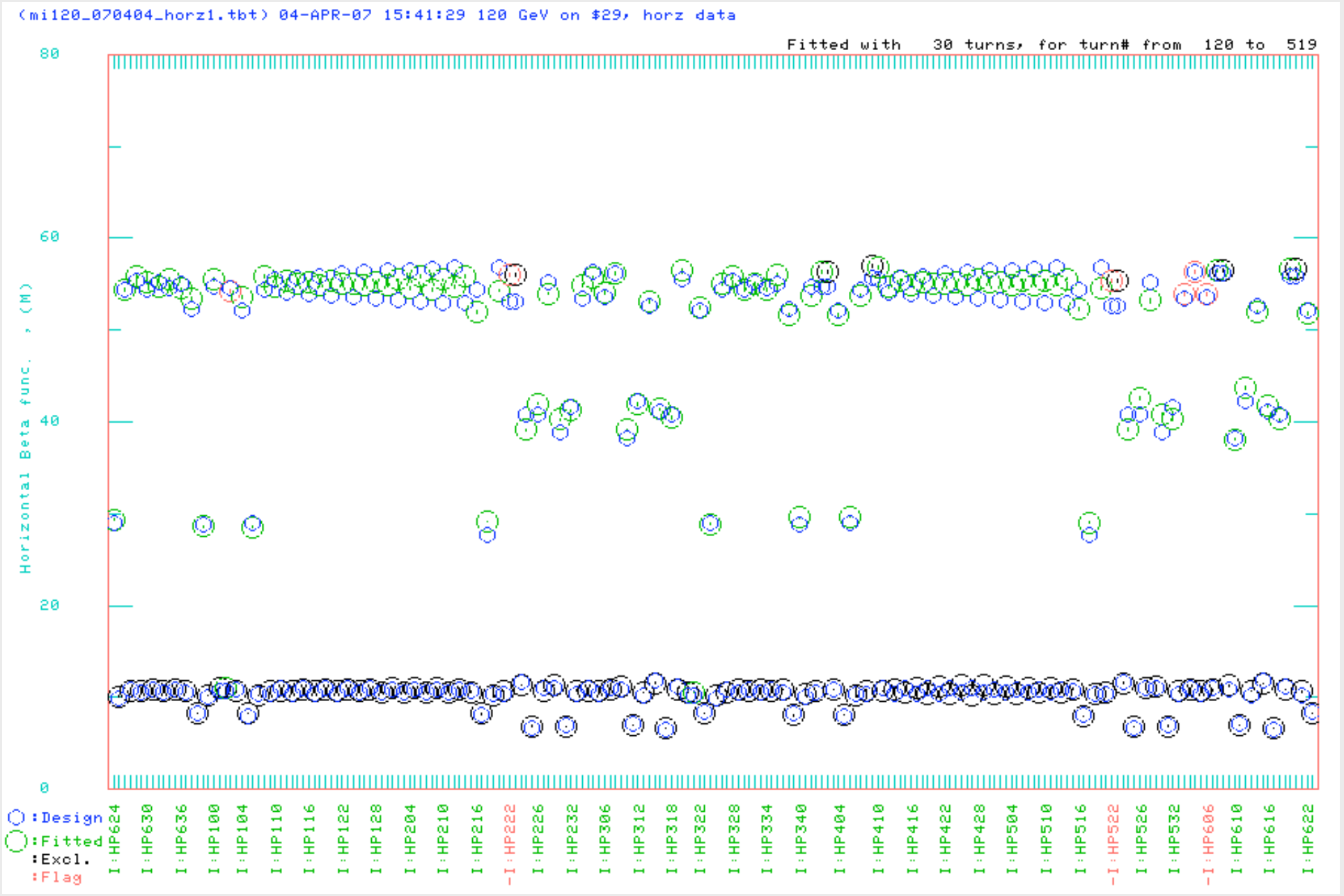
First 5 turns of TBt data, MI horizontal



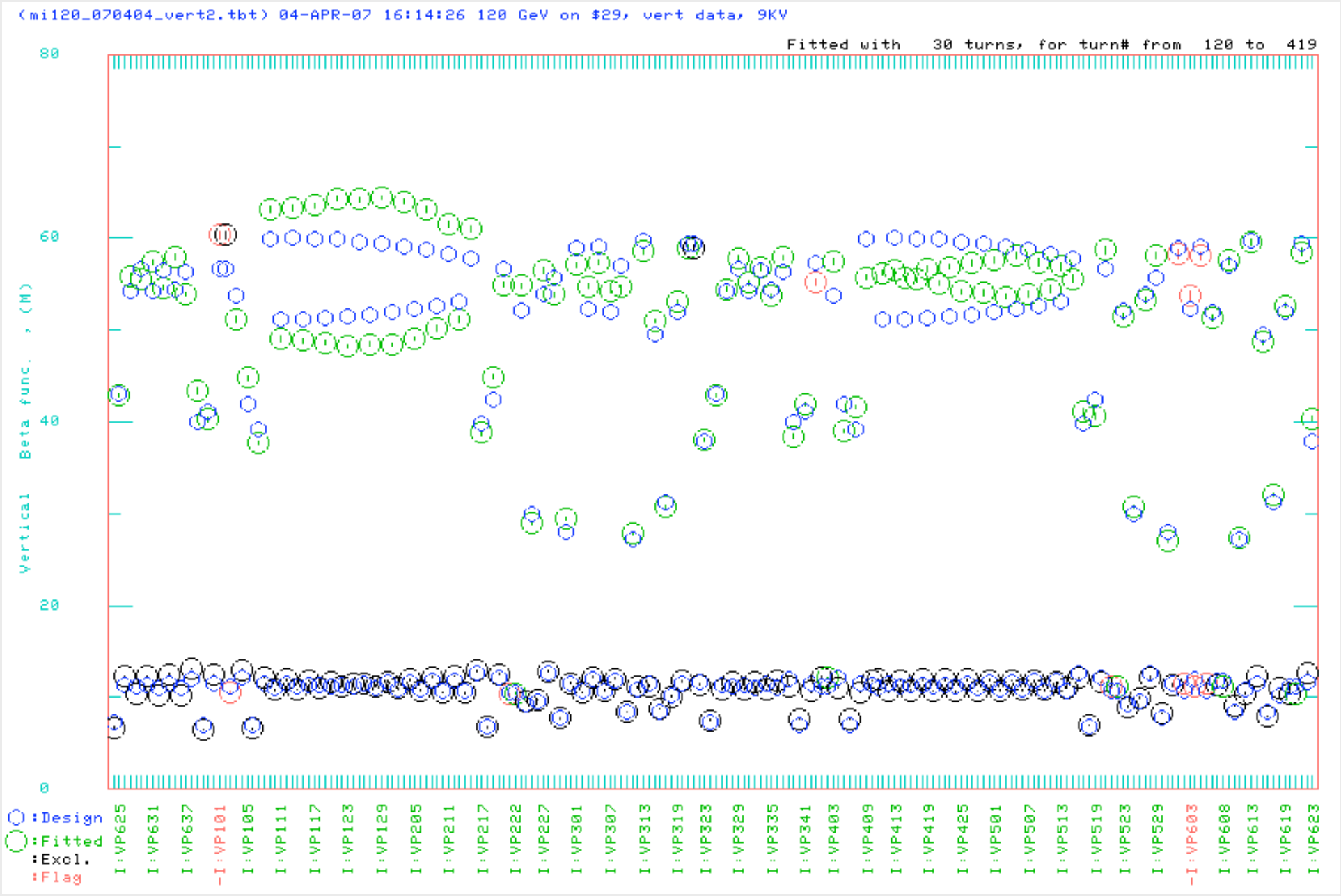
First 5 turns of TBt data, MI vertical



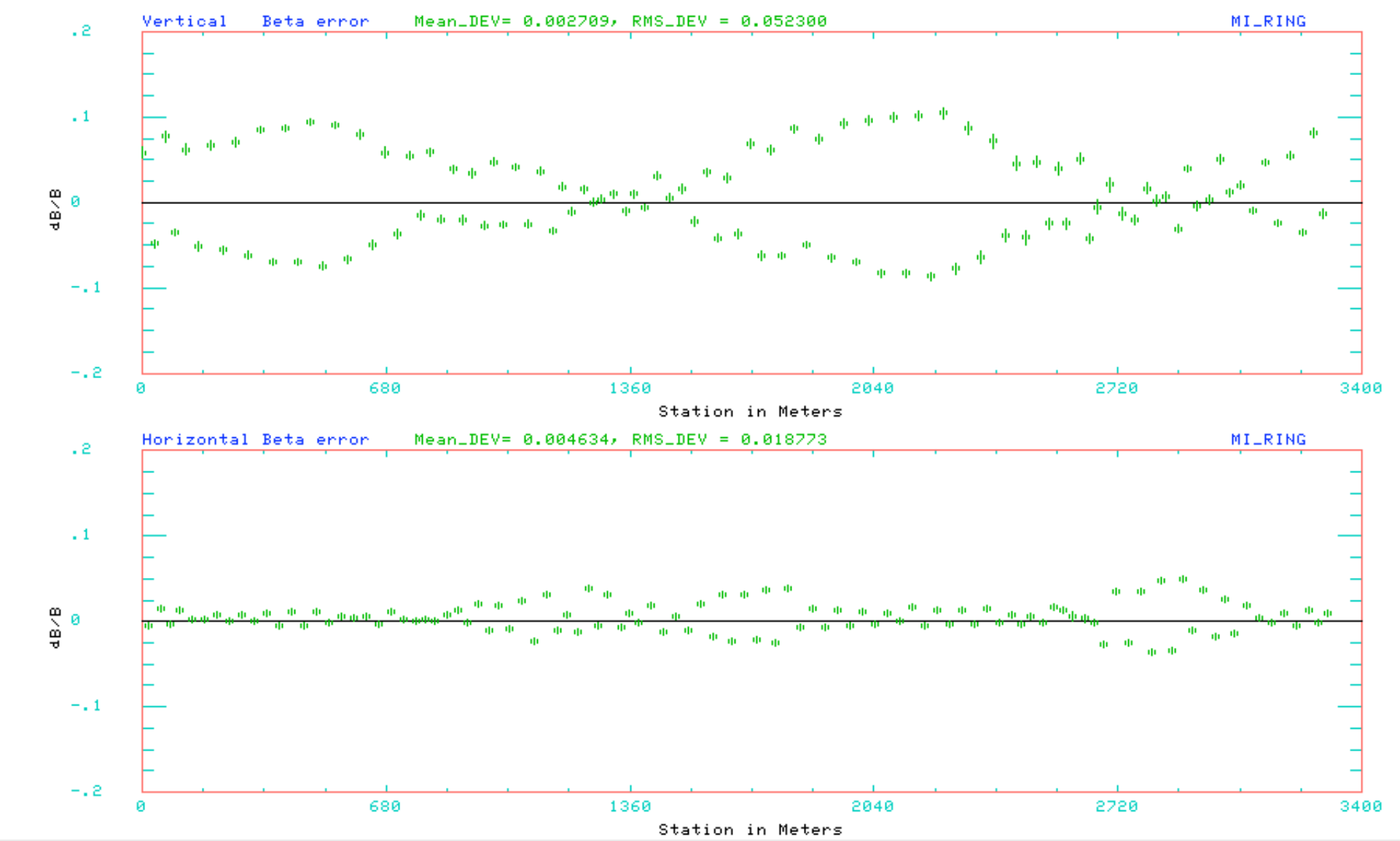
MI beta at 120 GeV, horizontal



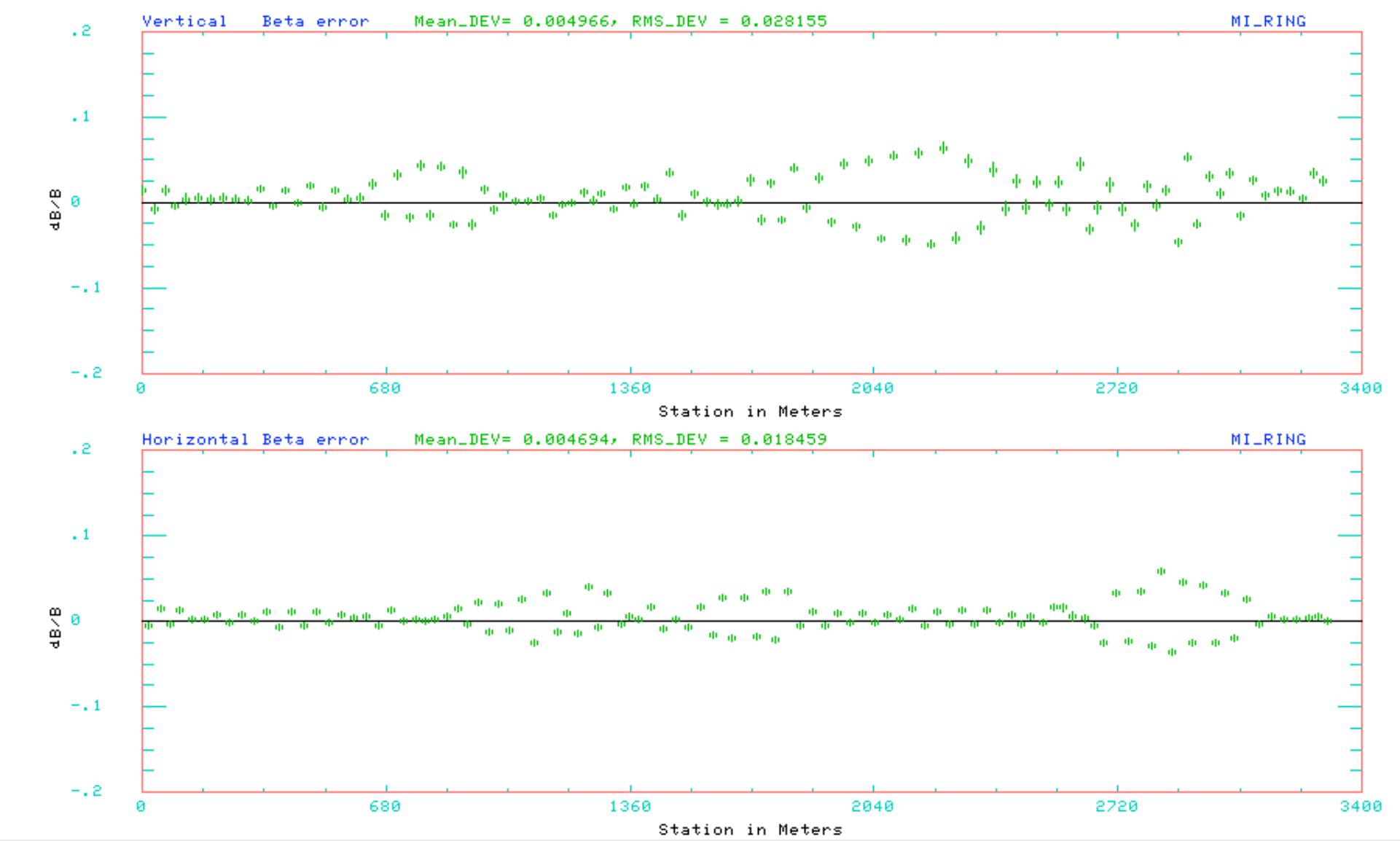
MI beta at 120 GeV, vertical



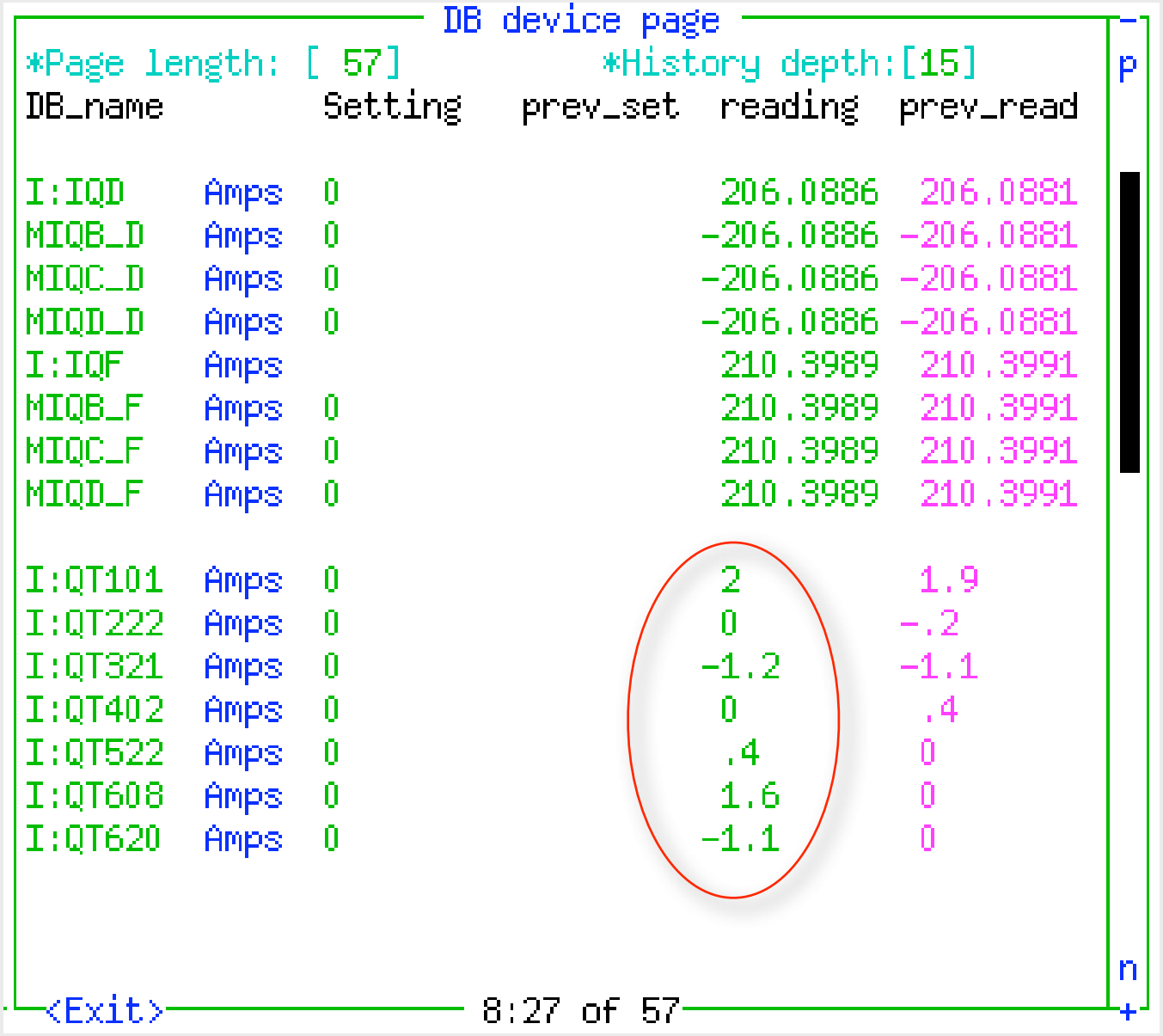
Horizontal & vertical Beta errors



Beta error with WQB trim currents

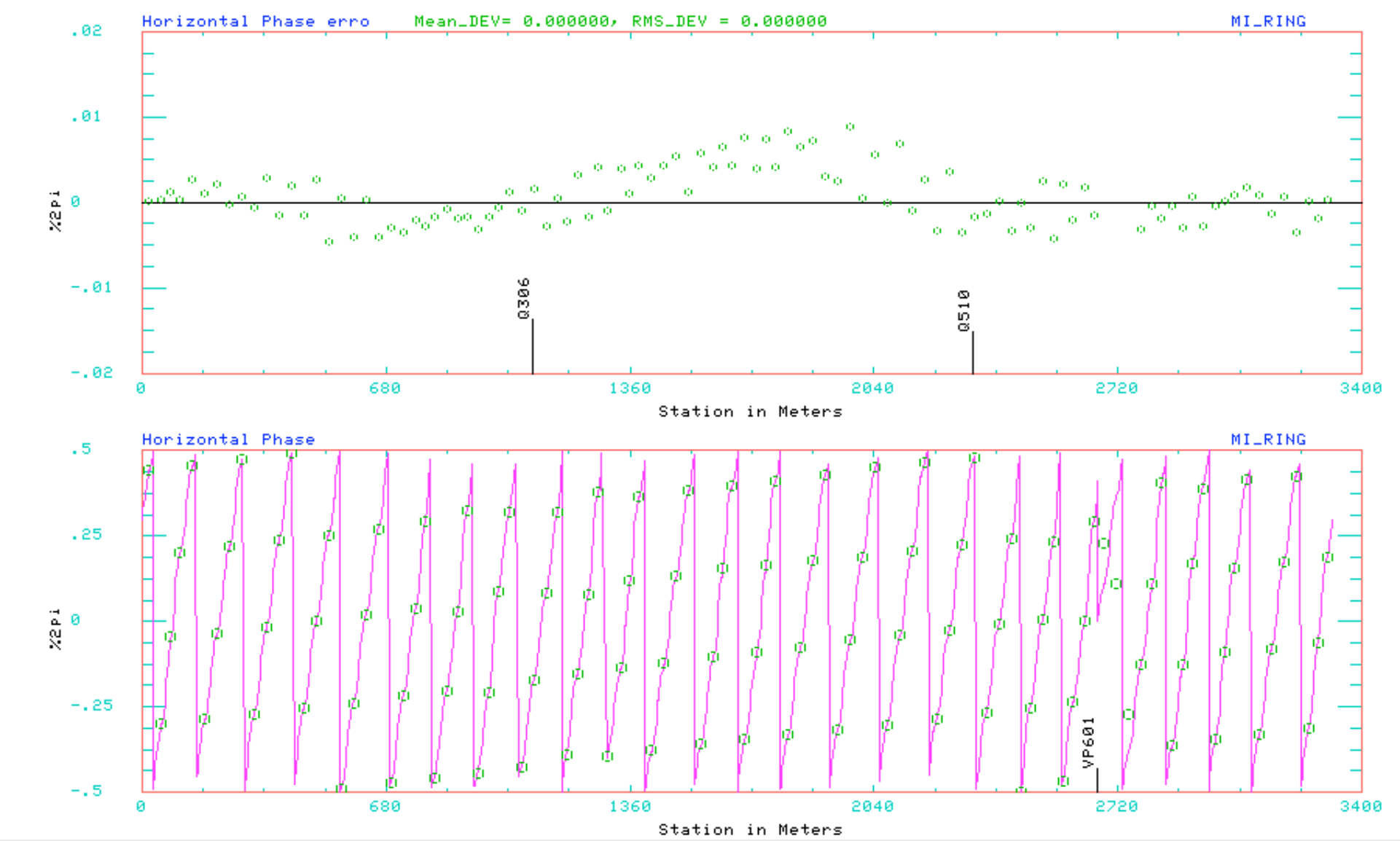


Trim current used for WQB

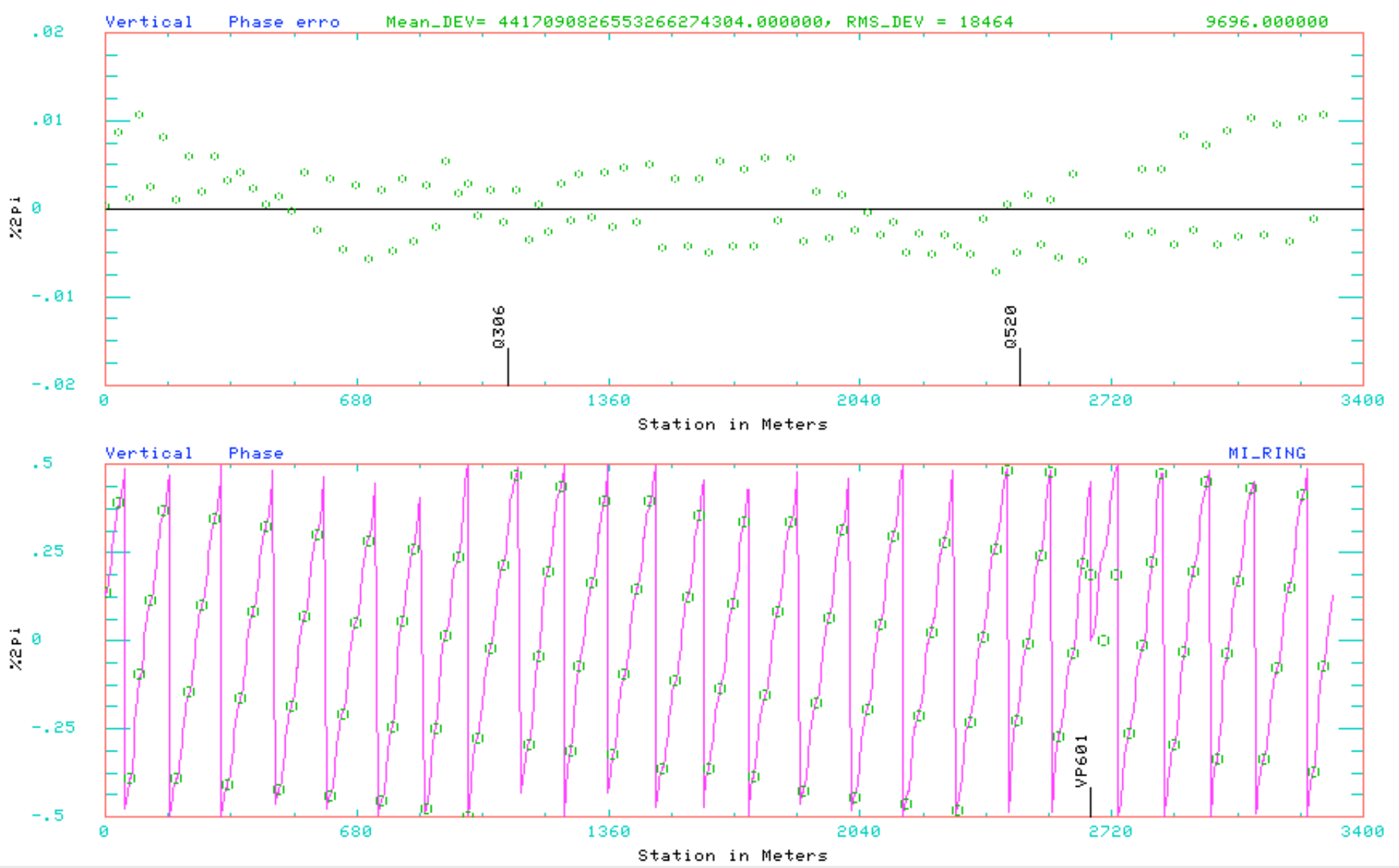


adjusted to get operation tune

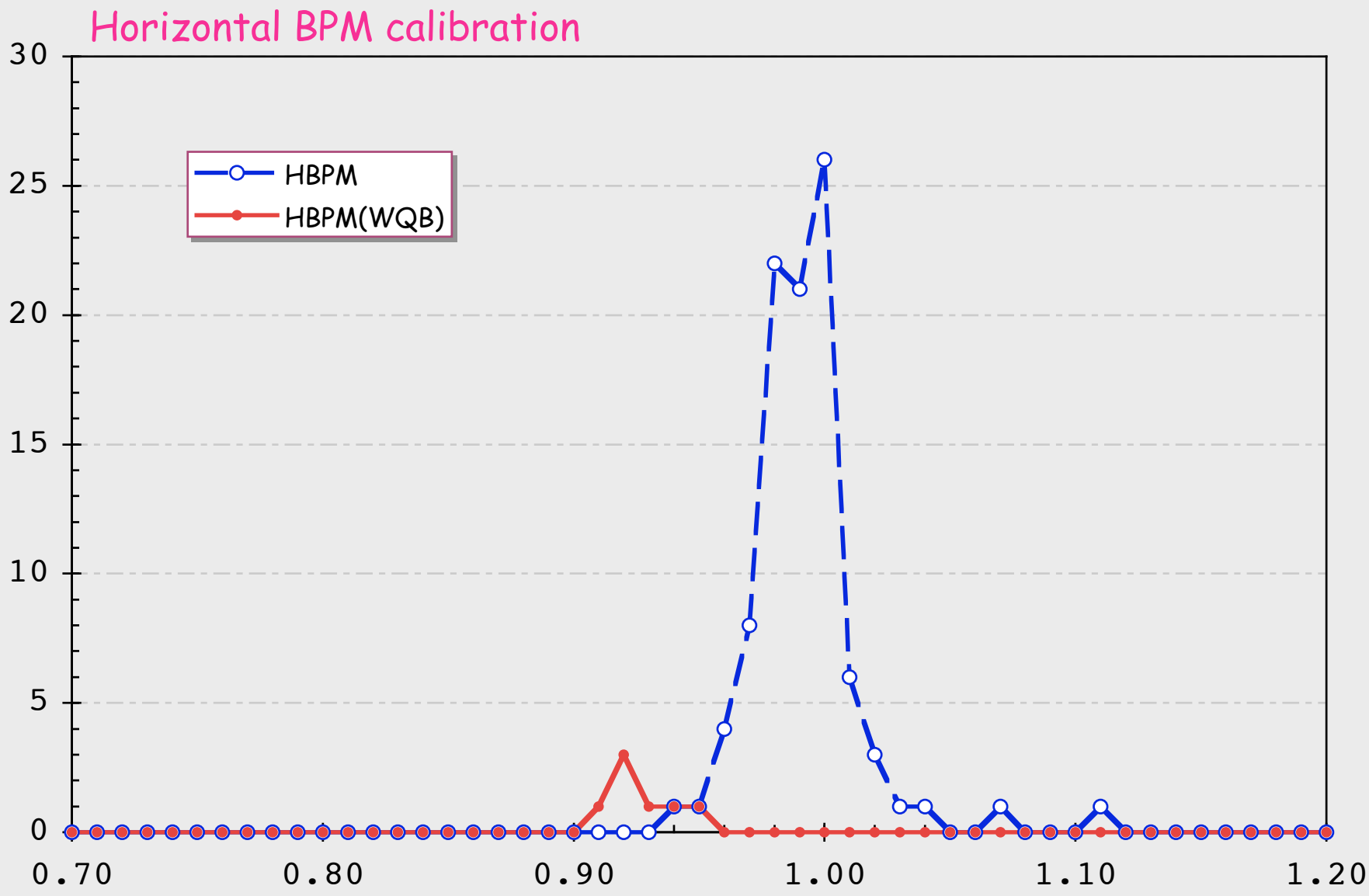
Horizontal phase advances



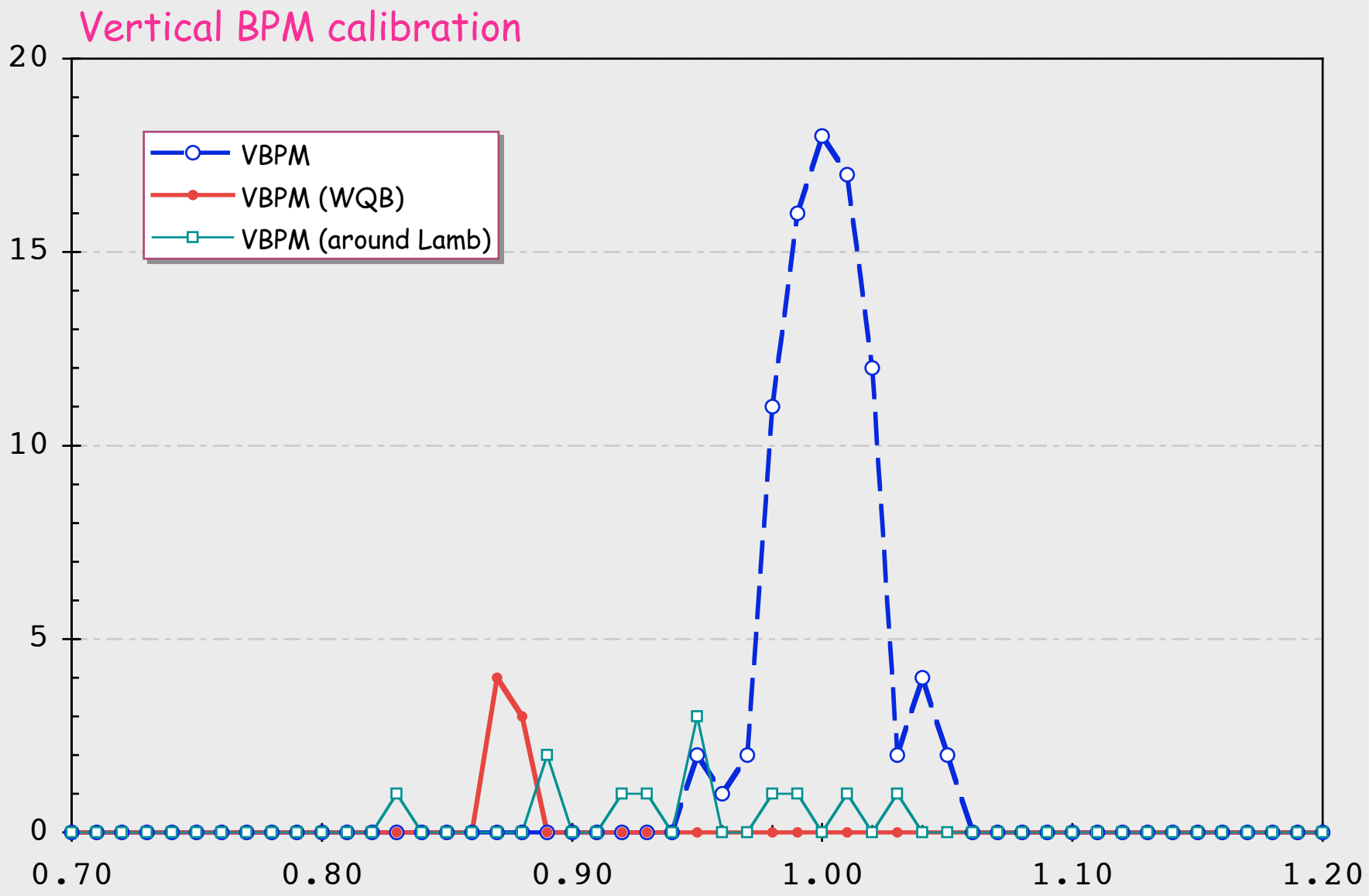
Vertical plane phase advances



Horizontal plane BPM calibration



Vertical plane BPM calibration



Data problems

- MI60S BPM
  - from VP601 to HP606
    - 3 in each plane.
  - Database modification was over-written.
    - Sep. 19, 2006: Echotek card was added.
    - Oct. 3, 2006: MI60S database devices updated.
    - Oct. 25, 2006: Data taken and working.
    - Nov. 14, 2006: Update was wiped out.
    - Nov. 20, 2006: Data taken indicated problem.
- HP532
  - Setup up error
    - Lattice function at VP531 was wrong.
  - Consequence to HP532
    - phase advance was off by one whole MI turn.
    - Only one affected

      The last before BPM seam at VP601.

Lattice result

- Horizontal plane
  - ~5% in Δbeta/beta
- Vertical plane
  - >10% in Δbeta/beta
- Adjusting trim current on WQB
  - Vertical error reduced to just over 5%.
  - Horizontal error unchanged.
  - Beta plot
    - URL:
      http://www-ap.fnal.gov/~yang/MI/MI120G_latt_070404/mi120_beta_ringwide.gif
    - Legend:
      Cyan trace: result with trim currents in WQB.
      Red trace: standard calculation result.
      Green circles: measured beta function.

BPM calibration

- For all regular MI BPMs
  - Most within ±0.5% of average.
- WQB BPMs
  - Vertical is off by ~11%.
  - Horizontal is off by ~7%
- Vertical BPM around Lambertson location
  - Not as clear cut.
  - Still substantial around 608.